



## **Philosophical Transactions**

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V. *An Account of Dr Robert Hook's Invention of the Marine Barometer, with its Description and Uses, published by order of the R. Society, by E. Halley, R. S. S.*

Since it was first found that the *Torricellian Tube*, commonly called the *Mercurial Barometer*, by the rising and falling of the *Quick-silver* therein, doth preface the Changes of the Air, in relation to fair and foul weather; upon several years observation of it, it has been proved and adjusted for that purpose by Dr *Robert Hook*; and there have been by him many attempts to improve the Instrument, and render the Minute Divisions on the Scale thereof more sensible. He also judging that it might be of great use at Sea, contrived several ways to make it serviceable on board Ship; one of which he explained to the *R. Society* at their weekly meeting in *Gresham College*, *January 2. 1667*, since which time he hath further cultivated the Invention, and some years ago produced before the said *Society*, the Instrument I am now to describe, which for its subtilty and usefulness, seemeth to surpass all other performances of the like nature.

Till such time as the Authors present Indisposition will give him leave to bestow freely his thoughts on this subject upon the Publick, it is the opinion of the *Society*, that such an account be given of this Contrivance, as may render it known, and recommend it to the Mariners use, for which it was principally intended.

The *Mercurial Barometer* requiring a perpendicular posture, and the *Quick-silver* vibrating therein with great violence upon any Agitation, is therefore incapable of  
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being used at Sea, (though it hath lately been contrived to be made portable) So it remained to find out some other principle, wherein the position of the Instrument was not so indispensably necessary : For this, all those that use the Sea are obliged to the great facility Dr *Hook* has always shewn, in applying Philosophical Experiments to their proper uses.

It is about 40 years since, that the *Thermometers* of *Robt. de Fluctibus*, depending on the dilatation and contraction of included Air by Heat and Cold, have been disused, upon discovery that the Airs pressure is unequal ; that inequality mixing it self with the effects of the warmth of the Air in that Instrument. And instead thereof was substituted the Seal'd Thermometer, including Spirit of Wine ( first brought into *England*, out of *Italy*, by Sir *Robert Southwell* ) as a proper Standard of the temper of the Air in relation to Heat and Cold ; that ætherial Spirit being of all the known liquors the most susceptible of dilatation and contraction, especially with a moderate degree of either Heat or Cold. Now this being allowed as a Standard, and the other Thermometer that includes Air being graduated with the same divisions, so as at the time when the Air was included, to agree with the Spirit-Thermometer in all the degrees of Heat and Cold, noting at the same time the precise height of the Mercury in the common Barometers : It will readily be understood that whensoever these two Thermometers shall agree, the pressure of the Air is the same it was, when the Air was included and the Instrument graduated : That if in the Air-Thermometer the liquor stand higher than the division marked thereon, corresponding with that on the Spirit-Glass, it is an indication that there is a greater pressure of the Air at that time, than when the Instrument was graduated. And the contrary is to be concluded when the Air-glass stands lower than the Spirit, *viz.* that then the Air is so much lighter, and the Quick-silver in the  
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ordinary Barometers lower than at the said time of Graduation.

And the spaces answering to an inch of Mercury will be more or less, according to the quantity of Air so included, and the smallness of the Glass Cane, in which the liquor rises and falls, and may be augmented almost in any proportion, under that of the specifick gravity of the Liquor of the Thermometer to Mercury. So as to have a foot or more for an inch of Mercury, which is another great convenience.

It has been observed by some, that in long keeping this Instrument, the Air included either finds a means to escape, or deposits some vapours mixt with it, or else for some other cause becomes less Elastick, whereby in process of time it gives the height of the Mercury somewhat greater than it ought ; but this, if it should happen in some of them, hinders not the usefulness thereof, for that it may at any time very easily be corrected by experiment, and the rising and falling thereof are the things chiefly remarkable in it, the just height being barely a curiosity.

In these parts of the World, long experience has told us, that the rising of the Mercury forebodes fair weather after foul, and an Easterly or Northerly wind ; and that the falling thereof, on the contrary signifies Southerly or Westerly winds, with Rain, or stormy Winds, or both ; which latter it is of much more consequence to provide against at Sea than at Land ; and in a storm, the Mercury beginning to rise is a sure sign that it begins to abate, as has been experienced in high Latitudes both to the Norwards and Southwards of the Equator.

The Form of this Instrument is shown in the Cut by Fig. 8. wherein

A B represents the Spirit-Thermometer, graduated from 0, or the freezing point, through all the possible degrees of the heat or cold of the Air, at least in these Climates.

C D

CD is the Air-Thermometer, graduated after the same manner, with the like degrees.

EF is a Plate applied to the side of the Thermometer CD, graduated into spaces answering to inches and parts of an inch of Mercury, in the Common Barometers.

G, a Hand standing on the Plate at the height of the Mercury thereon; as it was when the Instrument was graduated, as suppose here at  $29 \frac{1}{2}$  inches.

LM a Wire on which the Plate EF slips up and down, parallel to the Cane of the Thermometer CD.

K, any point at which the Spirit stands at the time of observation; suppose at 38 on the Spirit-Thermometer; Slide the Plate EF till the Hand G stand at 38 on the Air-Thermometer, and if the Liquor therein stand at 38 likewise, then is the pressure of the Air the same as at the time of Graduation; viz. 29, 5; but if it stand higher, as at 30 at I, then is the pressure of the Air greater; and the division on the sliding Plate against the Liquor, shews the present height of the Mercury to be 29 inches 7 tenths. And this may suffice as to the manner of using it.

I had one of these Barometers with me in my late Southern Voyage, and it never failed to prognostick and give early notice of all the bad weather we had, so that I depended thereon, and made provision accordingly; and from my own experience I conclude that a more useful contrivance hath not for this long time been offered for the benefit of Navigation.

These Instruments are made according to the direction of Dr Hook, by Mr Henry Hunt, Operator to the Royal Society, who will furnish any Gentleman with them, and give them directions how to use them.



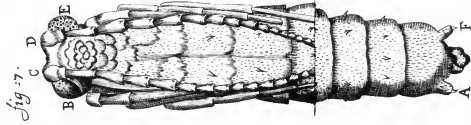


fig: 5.



fig: 4.



fig: 3.



fig: 1.

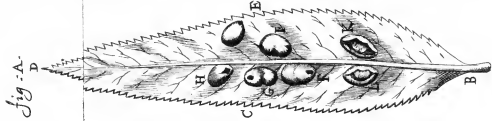


fig: A.

fig: 2.



fig: 8.

